Weekly Memorials

FOR THE

INGENIOUS:

OR,

An Account of Books lately ſet forth in ſeveral Languages, With other Accounts relating to *Arts* and *Sciences*.

Munday, *January* 15. 1683.

De Motu Animalium Jo. Alphonſi Borelli *Neapolitani*, *Matheſeos Profeſſoris*, *Opus Poſthumum*. Pars Prima. Romæ. 1680. *in* 4*to*.

WHile this *firſt* Volume was in the Preſs, the Worthy Author ſuffer'd the Law of Mortality; deceaſing at the Age of ſeventy one, of a *Pleuriſie*, among the *Mendicants* of the *Scuole Pie* at *Rome*, whoſe Youth he inſtructed in the *Mathematics*. By the hands of their *General* the whole Work is publiſh'd; and we have a Promiſe made of ſome *other Pieces*, which have not yet ſeen the Light.

This Part treats of the *External Motions* of *Animals*, and their *Powers*; which Deſign is proſecuted in a Mathematical Method, and illuſtrated with great Variety of Demonſtrations; it being a Receiv'd Maxim among Philoſophers, *that God and Nature work Geometrically*. He affirms that the Command of the *Soul* is perform'd by the *Nerves*; he gives us the Structure of a *Muſcle*, and ſays that it conſiſts of *Carnous* and *Tendinous Fibres*,

with ſeveral *Faſciculi* of a *Priſmatical* Form, *Hexagon*, *Square*, &c. which are made up of many *Filaments*; and that the *Muſculous* and *Tendinous Fibres* agree in this, in that they are both White; but differ in that the one are *Spongeous* and always *humected* by the *Blood*, *Nervous* and *Lymphatic* Juices, which the other are not; as alſo in their Structure and different way of Operating; he recites the ſeveral *Species* of *Muſcles*; he aſſerts that only the *Carnous Filaments* are ſhortned upon the Action of the *Muſcle*, but the *Tendons* retain the ſame Length; he animadverts upon *Steno* his *Hypotheſis* of *Muſcular Motion*, and gives us the *true Figure* of the *Muſcles*; he refutes the Opinions of the Ancients, that Nature moves with a ſmall Power great Weights; and endeavours to ſhew that on the Contrary ſmall Weights are mov'd and ſupported by great Power through the ſeveral Machines in the Bodies of Animals; ſo that the Motive Power exceeds the Weight of the Bones and Limbs mov'd many thouſand times; in order to this he furniſhes ſeveral *Theorems* concerning the Motions of the *Joints*, and the placing of the *Tendons* for the moving of the Bones.

He deſcribes the *Powers* of ſeveral *Muſcles*, as the *Biceps* and *Brachiæus*, according to their different *Poſitions*; as alſo of the *Muſcles* moving the *Tibia* and *Thigh*, and the various Increaſe of thoſe Powers, which vaſtly exceed the Weight to be mov'd; and conjectures at the Weight of the *Cylindrical* Parts adhering to the *Vertebræ* of human Body; and thereupon inquires into the Structure of the *Spina Dorſi*, and the Power which Nature exerciſes in the *Cartilages* of the *Vertebræ*, and the *Muſcles* of the *Back*.

Having thus far conſidered the *Flexures* of the *Limbs* caus'd by *Muſcles* conſiſting of *equidiſtant Fibres*; he proceeds to examine the Nature and Powers of the *Muſcles*, whoſe *Fibres* are *oblique*; as of thoſe moving ſome of the *Joints* of the *Fingers* and *Wriſts*, the *Deltoeides*, the *Glutei* and *Mandibulars*, *Temporals*, *Intercoſtals*, &c. and in order to that Enquiry gives us many *Mechanical Propoſi-*

poſitions: he affirms the *Muſculous Fibres* to be a *Series* of little *Machines* of a *Porous* Form, *Rhomboidal*, like unto a Chain compos'd of ſeveral *Filary Rhombi*, which *Rhomboidal* Pores are ſo little, that their Length is not greater than the 20th Part of an Inch; and that the Texture of a *Muſcle* is a *Reticular Compoſition* of ſuch little Chains: He ſhews the Powers as well of theſe little *Machines*, as of their whole *Series*, reſpecting the ſeveral *Magnitudes* and *Figures* of *Muſcles*.

From hence he proceeds to the Nature of *Standing* in Animals; a Speculation very pleaſant and uſeful; he affirms the Natural Poſition of the Limbs not to be in a direct Extenſion, which would be painful, but ſomewhat *inflex*, & that the *Muſcles inflecting* are ſhorter than the *Extenders*, tho both alike contracted: he ſhews how according to the Falling of the *Line of Support* from the *Centre of Gravity*, the Body either ſtands or falls; and that the *Centre of Gravity* in Man is between the *Nates* and the *Pubes*; and gives Reaſons why a Man cannot ſtand on one Toe or Heel, and but difficultly on one Foot, but eaſily on two; and that to ſtand ſafely 'tis neceſſary that the *Line of Support* muſt fall either on one of the Feet, or in a *Quadrilaterum* between the two Feet; alſo why we are leſs wearied by ſtanding *alternately* on either Legg perpendicularly plac'd, than when we are prop't alike by both, the *Muſcles* of one Legg being eas'd from their Extenſion in the former Poſition. He explains the Advantages which *Birds* have in their *Feet* above *Mankind*, and why they ſo eaſily ſtand on one Foot, and ſometimes ſleep on the Boughs of Trees without falling; he proves that *Quadrupeds* cannot naturally ſtand on one or two Feet erect, nor in a *Horizontal* Poſition unleſs they are ſupported by four or at leaſt three Feet; and aſſerts that Creatures of many Feet ſtand with greater Labour than *Quadrupeds*. He proceeds to the Conſideration of the *Progreſſive Motion* of Animals; he affirms that in the *going* of *Man*, the Power of the *Muſcles* lifts not up his *whole Weight*, but leſs than a *Quarter thereof*; he explains

the Manner how the Body is carried forward, not by a Right Line, but two Right Lines parallel, becauſe the *Line of Support* is tranſfer'd ſometimes on one Foot, and ſometimes on the other; he gives the Reaſon why Aſcending and Deſcending are laborious. He ſhews the Manner of *going* in *Quadrupeds*, who, he affirms, always have three Feet on the Ground at once, tho by erroneous Imagination the *Sculptors* have us'd to place them in *Statues*, with the two Feet diametrically oppoſite lifted up; and that Animals of many Feet go with more difficulty than *Quadrupeds*, tho that Inconvenience is compenſated by the ſmall Weight of their Bodies. He explicates the Nature of *Leaping*, and by what *Mechanic Elaſticity* it is performed, and how *Running* is an Advantage to that. Next he conſiders the Nature of *Flying*, and the wonderful Strength of the Structure of the *Wings in Birds*, whoſe *Flying* is only a Motion compounded of frequent *Leapings* perform'd through the Air; And ſubjoins the Magnitude, Diſpoſition, and Manner of Working of the *Muſcles* of their *Wings*. He obſervs in what Manner the Air reſiſts the Impulſe of their Wings, the Cauſe whereof he aſſigns to be from the *Circular* and *Elaſtic* Motions of the Air, and what Proportion of Power ought to anſwer that Reſiſtance; and that whereas in Man the Motive Power which cauſes *Leaping*, does exceed his Weight above *three thouſand* times, ſo the Power of the *Muſcles* moving the Wings exceeds the Weight of the Bird Flying more than *ten thouſand* times; the Reaſons whereof he explains. He affirms that the uſe of the *Tail* in Birds is to determine their Flight upward, and downward, but not laterally, which is perform'd by the Motion of the Neck, the Head and the Wing, as a Ship by the Helm: And concludes this Matter with a Diſcourſe ſhewing the *Impoſſibility* of that Project of *Artificial Flying* in Men, ſince the force of the *Pectoral Muſcles* cannot be ſo improv'd as to bear any conſiderable Proportion with the *Weight* of Man.

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To this ſucceeds the *Theory* of *Swimming*, wherein he ſhews the Difference between Swimming and Flying; that in *Flying* are required two Operations; the firſt is the Suſpenſion of the heavy Body of the Bird in the Air, perform'd by main force of the *Pectoral Muſcles* in making frequent *Leapings* through the Air; the ſecond is the tranſverſe Motion of the Bird which goes forward by Rowing; but thoſe Creatures which ſwim want no Power to ſuſpend them, being upheld by the Conſiſtence and Gravity of the Water, ſo that they cannot fall to the Bottom; and therefore only move about in that *Medium*, by the *Impulſe* of their own *Motory Organs*. He expounds the Differences of *Swimming*, premiſing from the Doctrine of *Archimedes*, that Bodies Swimming on the Surface of the Water and ſink not, but ſome Part of them bears above the Level of the Water, ſo that the Weight of ſo much Water as is equal to the immers'd Part is equal to the Weight of the whole Body Swimming; that theſe Bodies are leſs grave *in ſpecie* than Water; but, when Bodies being altogether immers'd in any Situation can reſt in the Water, do equiponderate to the Bulk of Water equal to them, theſe are equally grave *in ſpecie* with the Water; and thoſe which after a total Immerſion reſt not, but ſink to the Bottom, are more grave than the Bulk of Water equal to them, and therefore are called more grave *in ſpecie* than Water: He affirms that all Terreſtrial Animals while they are alive, and Birds and Fiſhes which reſpire and have Lungs, are not wholly immers'd, but one Part is emergent above the Water of its own accord, without any Exerciſe of the *Muſcles*, and theſe are leſs grave *in ſpecie* than the Water, and therefore may move on it, even as the Terreſtrial Animals upon the Earth; but becauſe theſe Animals are ſupported by the Weight, and not by the Hardneſs of the Water which it wanteth; hence it is that their Progreſſive Motion is made by the Rowing of their Feet and Arms, as in Ships; and after this manner Terreſtrial Animals, Birds, Frogs, and Tortoiſes Swim, or by a ſingle great *Oar* or *Tail* violent-

violently mov'd laterally, as ſome Boats, and the *Cetaceous Fiſhes*; or with a *Tail* ſpread out plain like an *Oar*, beating the Water up and down, as the *Dolphins*: Moreover all Fiſh, excepting the *Teſtaceous* Kind, and ſome few others, are equally grave with the Water wherein they are, and therefore are ſuſpended quietly in any Situation of its Depth; wherefore they can move freely, according to any Direction, by impelling the Water. He demonſtrates that an *Heterogeneous Body* either reſting, or being carried in a *Fluid*, will ſo accommodate itſelf that its *Centre* of *Gravity* may be in the neareſt Poſition toward the *Centre* of the *Earth*; hence he enquires concerning the *Centre of Gravity* in ſeveral *Animals*; he lays down, that Fiſhes being of equal Weight with the Water, do preſerve that Equality by a certain *Veſicle* full of Air plac'd in their Belly, which being lighter than Water compenſates the too great Weight of the Fleſh and Bones of Fiſhes, ſo that the whole *Compound* is of equal Weight with the Water; which Equality is preſerv'd in all Parts of the Water, and in ſeveral Sorts of Water, by the *Conſtriction* or *Dilatation* of that *Veſicle*, perform'd by ſtrong *Muſcles* encompaſſing the *Belly* of Fiſhes. He proves that Fiſhes move not by the Impulſe of their *Fins*, but by their *Tail*, as a *Rudder*; he demonſtrates that the Motive Power of the *Muſcles* in Fiſhes in order to *Swimming* is almoſt double to thoſe of Birds for *Flying*, and aſſigns the Reaſon thereof; he ſhews why *Birds* and *Quadrupeds* do naturally Swim, and why *Men* do not, who tho leſs grave *in ſpecie* than the Water, while they are alive, yet by reaſon of the improper Diſtribution of their Weight, and unfit Poſition of the *Centre of Gravity*, ſwim not naturally; ſince the Mouth and Noſtrils would be under Water; he gives the Reaſon why men unskilful of Swimming ſink and riſe three or four times, and afterwards ſinking for altogether, yet ſome while after the Carcaſs riſes and floats; he affirms that Men cannot live long under Water as Frogs, and the *Cetaceous* Fiſhes; he deſcribes two Machines as yet invented, whereby Men

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may breath under Water; he aſſerts that Men may reſpire and live many hours in a cloſe Veſſel under Water, if the Mouth of the Veſſel be open, for their receiving of new Air; he gives us a Machine wherein Men may breath and live under Water for many hours, and ſhews by what Artifice Men under Water may move at their Pleaſure or lye ſtill after the manner of Fiſhes. Laſtly he deſcribes the Fabrick of a *Navis Urinatoria*, which may be ſo mov'd, that it may either reſt in the Middle of the Water, or move any other way; an Invention much like that ſo much talk't of, and aſcrib'd to the Famed *Drebbelius*.

De Motu Animalium Jo. Alphonſi Borelli *Neapolitani Matheſeos Profeſſoris Opus Poſthumum. Pars Altera. Sub iisdem fauſtiſſimis Reginæ* Chriſtinæ *Auſpiciis.* Romæ. 1681. *in* 4*to.*

THis *ſecond* Part conſiders the *Internal Motions* of Animals, and their immediate *Cauſes*: And firſt the *Mechaniſm* whereby the *Contraction* of the *Muſcles* is perform'd, and the Cauſes of the *Wonderful Effects* of the *Motive Power* deſcrib'd in the fore-going Work. He affirms that a *Muſcle* is not contracted in its *Fibres* after the manner as the Filaments of a Rope lifting up Weight; nor by the proper force of its Machines by which its Fibres are contracted in the manner of a bent Bow; neither that the Contractive Power ceaſeth, being hindred by any Obſtacle, or acteth, that being remov'd; nor that the *Muſcle* is ſtretch'd and hardned by the reſt of its Parts; nor by drying, as Hair and Skins by Fire; nor by Corrugation, as in Worms; nor by Condenſation of the Length of the *Fibres*; but that the Contraction proceeds from hence, that its *Fibres* are fill'd up by a Body inſinuating itſelf by many *Wedges*. He rejects the ſeveral *Hypotheſes* hitherto propounded in order to explain *Muſcular*

cular Motion ; as that they are mov'd by an Incorporeal Faculty; or by Animal Spirits, Corporeal and Subtile, after the manner of an Air; nor by the Blood, or any other Juice filling up its Pores; nor by the Impulſe of the Heart ; nor that they are contracted and fill'd up by the Blood violently forc't in, either by the Compreſſion of the Air, or by the Weight of the Blood, after the ſame manner as Ropes wet are contracted : But that the *Vital Contraction* of the *Muſcles* proceeds from two Cauſes; the one the *Nervous Juice* inſtil'd *ad imperium Animæ*, the other the *Blood* reſiding therein ; from whence does ariſe a Fermentation and Ebullition after the manner of ſeveral Chymical Liquors put together. He removes Objections againſt his *Hypotheſi* ; and explains the great *Motive Power* in the *Muſcles* by the infinite Number of the *Wedges* which are inſinuated into the Body of the *Muſcle*. He proceeds to conſider the *Circulation* of the *Blood*, which he affirms indubitable, which Circular Motion is continual, tho it may ſeem interrupted in the Heart, between the *Syſtole* and the *Diaſtole* ; he gives the Mechanical Reaſon of the Continual Courſe of the Blood through the Veins, and ſhews the Advantages thence ariſing ; as the Preſervation of its *Craſis*, and the Neceſſity wherefore Nature hath made that Motion ſo quick, as to perform its Circle in little more than the 20th Part of an hour ; and why that Circle ought to be ſo often repeated ; he examines the Motive Power of the *Heart*, and the Mechanical Cauſe whereby it works ; in order thereto, explains the *Muſcular* Structure of the Heart, and its manner of acting, which is the Conſtriction of its Ventricles, and Compreſſion and Forcing out the Blood therein contain'd, in the manner of a Preſs ; not by a Contorſion of the *Spiral Fibres*, but by filling up and extending them ; he gives the Reaſon why the beating of the Heart in the *Syſtole* appears on the left ſide, and explains the Uſes, Actions and Mechanical Cauſes of the *Auriculæ* of the Heart and its *Valves* ; he exhibites a Method to find the Motive Power of the *Muſcle* of the Heart,

Heart, which he affirms to be able to overcome a Reſiſtance of more than three thouſand Pound: He lays down that the immediate Motive Cauſe of the Heart, differs not from that which moves the *Muſcles* of the *Limbs*, it proceeding from a filling up of the *Veſiculæ* or its Pores by a Fermentative Ebullition of the Blood, and Spirituous Juices; tho it differ in this, that other *Muſcular Motion* ſeems voluntary, but this by an Organical Neceſſity; altho it may likewiſe proceed from the ſame knowing Animal Faculty, but not obſerv'd by Reaſon of a Conſtant Habit acquir'd. To this ſucceeds the Diſcourſe of *Reſpiration*, the *Phænomena* whereof are explain'd: He aſſigns the efficient Cauſe of *Inſpiration* to be the Power of the *Muſcles* enlarging the Cavity of the Breaſt, together with the Weight and Spring of the Air, wherewith it ruſheth into the Breaſt, and filleth up the *Lungs*; the *Thorax* being as *Bellows*, and the *Lungs* as a *Bladder*; To this Motion of *Inſpiration* the *Intercoſtal Muſcles* and *Diaphragms* do cooperate, which is promoted by the Compreſſion of the Ribs. In *Expiration* when *Gentle* and *Natural*, the Air is not forc't out by the Power of any *Muſcles*, but that proceeds from the Reſt and Ceſſation of the *Intercoſtal Muſcles*; and from the *Relaxation* of the *Diaphragm*, and *Dilatation* of the *Epiglottis*, whereunto may be added its own *Elaſtic* Power: *Violent Expiration* is aſſiſted by the *Compreſſion* of the *Ribs*, and by the *Muſcles* of the *Abdomen*. To this is annex'd a Conſideration of the Structure of the *Thorax* and *Lungs*, and the ſeveral manners of *Reſpiration* in divers Animals, as in Terreſtrial Animals, Birds, Tortoiſes, Inſects, Fiſhes and *Amphibious* Creatures. He enquires into the Primary *Uſe* of *Reſpiration*, which he aſſerts not to be for the Cooling the Heat of the Heart, nor for the Diſcharging of *Fuliginous* Matter, nor for the exact Mixture of the Parts of the Blood together, ſince that *Reſpiration* and the Motion of the *Lungs* do rather diſſolve the former Mixture, by dividing the Blood into the leaſt Particles; he affirms that *Life* depends not *abſolutely* upon *Reſpiration*,

in as much as it helps the *Circulation* of the *Blood*; and that the Chief Uſe of *Reſpiration* is not the Tranſfuſion or Percolation of the Blood from one Ventricle of the Heart to the other: He aſſigns the Air taken in by *Reſpiration* for the Chiefeſt Cauſe of the Life of Animals, which he illuſtrates by Experiments; he ſhews how the Particles of the Air are mixt with the Blood by Inſinuating itſelf firſt into the Watry Juice which it finds in the *Veſicles* of the Lungs; he confutes their Opinions who affirm, that the Air does render the Blood more fluid, or that it produceth any Ebullition in the Heart by its *Elaſtic* or *Nitrous* Faculty; he explains the Mechanical Reaſon of that Continual Tremulous Motion which the Air produces in the Blood; and particularly aſſigns the manner how the Mixture of Air by Reſpiration preſerves the Life of Animals, the Vital Motion of the Particles of the Blood being regulated by the little Machines of the Air, after the manner of a *Pendulum*; and ſays that even *Plants* partake of a certain Shadow of *Reſpiration*. He ſolves that *Phænomenon* why the *Fætus* after having once breath'd, does perpetually continue it; he gives a Reaſon of the ſudden Death of Animals in an Air too ſubtile, or in a *Vacuum*; why difficult Breathing ariſeth on Violent Exerciſe; why the Breath is held when a Man either lifts up a great Weight, or exerciſeth extraordinary Force; why in a very thin Air, the Motion of the *Muſcles* being Laborious, difficulty of Breathing ſucceeds; why Water penetrating into the Lungs of Animals ſuffocates them; he gives probable Cauſes of *Suffocation* from a thick and too much condens'd Air; he treats of the Original of Qualities, which he deduces from the ſeveral *Modifications* of the minute Particles, and ſhews the Organs and Mechanical Operations whereby Mixtures are perform'd in Plants and Animals, which ariſe from an Orderly Situation, Poſition, and Configuration of Particles acquir'd in paſſing through accommodate Orifices of Pipes diverſly figur'd, and partly reſulting from a due Diſtribution of the Particles

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conglutinated by the Texture of thoſe Pipes: He lays down that the *Blood* returns to the Right Ventricle of the Heart, torpid and unfit for Nutrition; and explains the Mechanical Operation whereby the Structure of the *Blood* is compleated in the *Vena Pulmonaris* by paſſing through the moſt ſubtile *Ramifications* of the *Fiſtulæ* of the Lungs, and being enlivened by the Spirits tranſmitted thither by the Nerves; he examins the Compoſition of *Milk*, which he compares to *Froth*, and that in *Milk* the Watry Drops diſſeminated and included within the tenacious Pores of the *Caſeous* Juice, do neceſſarily acquire an *Orbicular* Form by Compreſſion every way made, and on the contrary the ſides of the Pores by reaſon of the ſoftneſs of their *Glutinous* Subſtance can be drawn out and expanded into *Subtile Membranes*, which cannot eaſily be torn and broke, being hindred by their *Tenacious Viſcoſity*: To this he adds the Nature of *Coagulation*. He aſſerts that *Deſtillation* is not capable of giving us the true *Anatomy* of the *Blood*; he affirms that the *Blood* is divided into *two* Principal Parts, the *Albumen*, and the *Reddiſh Part*; the *Albumen* he ſubdivides into two Subſtances, the one *Viſcid* like Whites of Eggs, the other a Watry *Serum* impregnated with *Ammoniacal*, *Tartarous* and other *Salts*; likewiſe the *Reddiſh Part* conſiſts of a certain *ſlippery glutinous* Subſtance, and a *Purple* Juice, which clinging together become *grumous*, and after *Concretion* by ſeveral Waſhings in Water, the *glutinous* Part appears collected into *white Fibres*, or *reticular Membranes*, as appears in *Pidgeon's Blood*; but the *Red grumous* Part ſinks in the Bottom of the Water, in the Form of a *Red Powder*; beſides which Parts ſeveral *Particles* of the Air are mixt with the *Blood* in the *Lungs*, together with ſeveral *Spirituous* Juices diſcharged by the *Nerves*; and he ſhews why the *Blood* by the *Circulation* is preſerv'd from Coagulating, which it doth being extravaſated. The *ſecondary Uſes* of *Reſpiration* he paſſeth by, having been largely treated on by others.

The next Subject is the *Diſcharge* of the *aqueous Seroſity* impregnated with *Saline* and *Tartarous Particles* in the *Kidneys*; he affirms the *Kidneys* not to conſer ſo immediately to the Preſervation of *Life* as the *Heart* and the *Lungs* do, which conſerve and produce the *Vital Motion* of the *Blood*, tho if that *Diſcharge* by the *Kidneys* be neglected, the *Blood* will ſoon be *unfit* for *Life*; He ſhews the Uſe of *Plentiful Drinking*; explains the ſeparatory Working of Fermentation, which ought to be, not in ſmall Pipes, but in large Veſſels, not by quick, but ſlow Motion and long Time, unleſs the Particles are very Spirituous; he affirms that it is poſſible that the Separation of *Heterogeneous Fluids* mixt together, may be perform'd without any Fermentation, by a Mechanical Neceſſity from the Configuration of the little Veſſels through which they paſs; he infers that the *Serum* is not ſeparated in the *Kidneys* by Fermentation, but by a Mechanical Neceſſity from the Narrowneſs and Configuration of the Veſſels; he examines and confutes the contrary Opinions.

He comes now to the *Uſe* of the *Liver*, and after having mentioned with Praiſe, the Obſervations made by thoſe Excellent Anatomiſts, Dr. *Gliſſon*, *Wharton*, *Willis* and *Malpighi*; he firſt explains the *Structure* and Mechanical Manner whereby the *Glandules* operate, whereof ſome he allows to be Store-Houſes of a Fermentative Juice, but not all; he aſſerts that the *Gall* is ſeparated from the *Blood* in the *Liver* Mechanically, without the Help of any Ferment, only by *Cribration* in the moſt minute Veſſels of the *Vena Porta*, and the *Pores* of the *Glandules* of the *Liver*, as in the *Kidneys Urine* is ſeparated; ſince, if ſo, a Fermentative Juice of the ſame nature and as bitter as the *Gall*, muſt reſide in the *Glandules* of the *Liver*, or be brought thither from elſewhere, both which are contrary to Experience, ſince the *Glandulous* Subſtance of the *Liver* is ſweet, nor are there any Veſſels to bring that Ferment, and the Paſſages too narrow for any Ferment to be perform'd therein.

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He ſhews that in one *Circulation* of the *Blood*, a Part leſs than a 25*th* of the whole Maſs, paſſeth through the *Liver*, which he proves by comparing the *Diameter* of the *Meſenteric Arteries* with that of the Trunk of the *Aorta* coming out of the Heart; that the *Gall* which is collected in the *Liver* from the *Vaſa Biliaria*, cannot be ſeparated from the Maſs of Blood which is without the *Abdomen*, in the Arteries and *Vena cava*; that the *Gall* diſcharg'd from the *Liver*, in a days time, from a Perſon *faſting*, is ſixteen times more than that which is in the Maſs of Blood, there paſſing thirty four Pound of *Bilious* Juice into the *Duodenum*, by the *Vaſa Biliaria*, and the whole Maſs of *Gall* contain'd in the *Blood* not exceeding two Pound, a tenth Part of the Maſs of the Blood, whence he infers that this Quantity of *Gall* is not produc'd by Fermentation, and that there is a Particular Circulation of the *Bilis*, through the *Abdomen*, perform'd by the *Venæ Meſaraicæ* into the Trunk of the *Porta*, thence to the *Liver*, thence through the *Vaſa Bilioſa* into the *Duodenum*, to return again by the *Meſaraic Veins*. He ſubjoins the Neceſſity and Uſe of that Circulation of the *Gall*.

He proceeds to conſider the *Motion* of the *Spirituous Subſtance* contain'd in the *Nerves*; he affirms that *Nutrition* is perform'd by the Concurrence of the *Nervous Juice* with the *Blood*; that the *Spirits* move through the *Nervous Channels* by *contrary* Motions through the ſame *Nervous Channels*; from the Motion toward the Brain Senſe ariſing, from the Contrary, Muſcular Motion, according to the *Vellication* of the ſpongeous *Tubuli* of the *Nervous Fibres* in ſeveral Parts: He affirms that the *Nutritious Nervous Juice* is different from the *Spirits* performing Local Motion and Senſe; and enquires into the Ways through which it is tranſmitted from the Brain to repair the ſeveral Parts; which he makes to be the *Interſtitia* of the *Fibres* contain'd between the Membranous *Vaginæ*, which carry this Nutritious Juice differing from that wherewith the Spongeous *Tubuli* of the

the *Fibres* are fill'd; he explains likewiſe the Motion of this Nervous Juice to the Brain, and gives a Mechanical Solution of the Quickneſs of theſe Motions; he aſſerts the Diſcharge of this Nervous Juice from the Brain in order to Nouriſhment, to be perform'd in the time of *Sleep*, and to be the Cauſe thereof, by its Ebullition obſtructing the Orifices of the *Tubuli* of the *Nervous Fibres*; he ſhews why the Motion of the Heart ceaſeth not in *Sleep*, the Nerves moving it, being ſo diſpos'd as not to be obſtructed; alſo why *Reſpiration* is not hindred, and why ſometimes the Limbs move in time of Sleep, and ſome Perſons walk.

The next Conſideration is of the *Spirituous Seminal Juice*, its Generation, Motion and Nature. Firſt he gives us the Structure of the *Teſticles* according to late Anatomical Obſervations; the Structure of the Seminal Paſſages; the Elaboration of the Seminal Juice perform'd Mechanically through the various Labyrinths, wherein he alloweth ſomewhat of Fermentation; he aſſerts the Subſtance and Organical Texture of the *Teſticles* to be much like that of the *Brain*, from whence in the Act of Generation the Animal Spirits are in great Plenty, and with much force transfuſed to the *Teſticles*; he ſhews that the *Spirituous Juice* in the *Teſtes* is a moſt Powerful *Elixir* or *Balſam* not only *prolific*, but alſo encreaſing and perfecting the Mind and Body of Animals; that this *Spirituous Juice* elaborated in the *Teſtes* is diſpers'd through the whole Body by the Nerves alone; that the *Animal Spirits* move *circularly* as well as the *Blood*, tho the *Way* not fully diſcover'd.

The next Subject is that of *Generation*, wherein firſt is conſider'd the Mechanical Artifice of *Generation* and *Vegetation* in *Plants*; he affirms that in the *Seed* of every Plant is contain'd a *Plant* of the ſame *Species* moſt exactly delineated, this he confirms from the Microſcopical Obſervations of *Malpighi*; he premiſes a Deſcription of the *Thermometer* of *Sanctorius*, whereof the *Veſica* at the Top being warm, and the *Tube* immers't in Water,

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the *Reciprocation* of the *Water* indicates the *Temperament* of the *Air*, as to *Heat* and *Cold*; he affirms that the *Roots* and *Trunks* of Plants do reſemble *that*, with the Advantage of their *Spongeous Cavities* and *Valves*, and that the *Nutritious Liquor* of Plants is ſuck'd in in like wiſe; which Theory he aſcribes to his Maſter the Abbot *Benedetto Caſtelli*; he aſſerts that *Water* is the *Nutritious Juice* of Plants, tho impregnated with *Salts*, and *Sulphurous* Particles, receiv'd from the *Earth*, which ſeem rather as *Condiments* to that Juice, and from whence *Germination* and *Fructification* of Plants are promoted; that this *Aqueous Juice* is not tranſubſtantiated into a Plant by Vertue of any *Ferment*, but depends on the *Cribrous Structure* of the *Veſſels* of the Plant; that the *Air* is the Principal Cauſe of the *Diſtribution* of *Aliment*, and therefore *Plants* may ſeem to have an *imperfect Reſpiration*, whereupon their *Life* depends and is preſerv'd. To this ſucceeds the *Theory* of *Animal Generation*; and after having gratefully mentioned and commended thoſe Excellent Authors, *Fabritius ab Aquapendente*, Dr. *Harvy*, *Malpighi*, *De Graeff*, &c. He affirms that *Generation* is perform'd by the *Semen Virile*, and the *Ovum Muliebre*; that the *Egg* is not made fruitful by any Incorporeal Power, or by a *Flatus*; but by a Contact and Mixture of Particles; and that the Organical Conſtruction of the Animal in the Egg, depends not only from the Mother, but is chiefly form'd by the Paternal Seed, which moves and figures the Juice contain'd in the *Gemma* of the *Cicatricula Seminalis*, and afterwards animating it with *Vital Spirits* renders it a *compleat Egg*; the manner whereof he compares to that of an *Automa*, or Clock compos'd of various Wheels mov'd by Weights regulated by a *Pendulum*: He mentions with honour the Experiments of *Sanctorius* concerning *inſenſible Tranſpiration*, the defect whereof is the moſt general *Cauſe* of *Diſeaſes*, the Bodies of Animals being like a River in a conſtant Flowing, *inſenſible Tranſpiration* is abſolutely Neceſſary for the Preſervation of Life. Concerning the *Nutrition* of *Animals*, he enume-

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rates the *preparatory Operations* whereby the *Food* is turn'd into *Chyle*, as in ſome by *chewing* with the *Teeth*, in others by the great *Power* of their *Muſculous Ventricle*, and by the help of *Stones* which they ſwallow, which ſerve as *Grind-Stones*, in others which have only a *Membranous Ventricle* is plac'd a moſt *Powerful Ferment* proceeding from the *Glandules*, as particularly in the *Dolphin*; he conſiders the Structure of the *Carnous Ventricles* of Birds, and the great force of their *Fibres* much exceeding thoſe of the *Heart*; he affirms that ſome *Animals*, as the ſmaller *Teſtaceous* Kind, are nouriſh'd by *Sand*; nothing elſe being found in their Bellies; it being not improbable, ſince *Bones*, *Teeth* and *Stones* in Animals are generated from the *Sanguineous Juice*, that *Sandy Particles* may be turn'd into a *Nutritative Juice*; he opines that ſome Animals, as *Oiſters*, &c. and *Plants* may be nouriſh'd by Water alone, which he confirms by Experiments; and ſuſpects that ſome *Birds* are nouriſh'd from the *Stones* which they ſwallow; and aſſigns a Reaſon why the more *perfect Animals* live on *Herbs*, *Fruits* and *Fleſh*, their *ſenſitive Operations* requiring a more *ſhort* and *eaſy Elaboration* of *Aliment*: He affirms that ſome Part of the *Chyle* is carryed to the *Liver* with the *Bilis* through the *Meſenteric* Veins; which he proves by ſeveral Reaſons; He aſſerts the *Blood* and *Nervous Juices* to be the immediate Matter of *Nutrition*, that the Blood by the Impulſe of the Heart, and Conſtriction of the Arteries is wedg'd into the ſeveral Parts fit for its Reception, in order to the Reparation of what hath been diſſolv'd and tranſpir'd, the Air aſſiſting thereto; and the *Nervous Juice* diſcharg'd from the Brain in the time of Sleep compleats all by its *plaſtic* Faculty: He aſſigns the Cauſe of *Hunger* to be from the *Corroſive* Juices diſcharg'd from the *Excretory* Veſſels of the *Glandules* in the *Stomach*, pricking and vellicating the *Nervous Tunics*, & cauſing that Pain which we call *Hunger*; and the Cauſe of *Thirſt* to proceed from the *Vellication* of the *Nerves* either *compreſs'd* by the *Dryneſs* of the *Tunics*, and *diſtraction* of the *Nervous Fibres*, or being *prick't* by *Saline Particles*

Particles; the Remedy of *Hunger* being by *Food*, which ſucks up that *Corroſive Juice* like a *Sponge*, and of *Thirſt* by *Drink* diluting or waſhing away that troubleſome *Saline Fermentitious Juice.*

After theſe *Animal Motions*, he conſiders thoſe which are *Dolorific* and *Morbific*; he aſſigns the Principal Cauſe of *Pain* not to proceed from a ſimple Cutting off of the *Nervous Fibres*, nor from a Diſſolution of their Compoſition, and Texture, but from a *Vellication* irritating the *Nerves* and *Spirituous Juices*, whoſe irregular Motions being communicated to the Brain, produce that Troubleſom and Convulſive Paſſion which we call *Pain*; which Pain is ſometimes ſtop't by *Narcotics*, whoſe Faculty it is to bring the Spirits to reſt; He conſiders the Nature of *Laſſitude*, how it is ſometimes produc'd by loſs of Spirits, and in what manner from the Hurt of the Organs; and gives a Reaſon why we are more wearied by *Standing* than *Walking*, the one being a *Continued* Action of the ſame *Muſcles*, the other *Interrupted*; and why vehement and unuſual Motions produce Pains of the Limbs: He gives an Account of *Convulſive Motions*, which he affirms not to proceed, as is commonly taught, by *Contraction* or *Relaxation* of the *Nerves* by Drought and Moiſture, but from an *involuntary Contraction* of the *Muſcles* caus'd by a *Morbific Juice* irritating the *Nerves*; he examines the Nature of *Trembling*, firſt how *voluntary Tremblings* are made, as in ſhaking the Hand or Tongue; how *involuntary Tremblings* proceed from the *Relaxation* and *Conſtriction* of the little *Machines* compoſing the *Fibres* of the *Muſcles*; how *Trembling* is caus'd by want of Spirits, by Fear and Cold, by Diſeaſes, Palſy, Fevers, and Old Age; and explains the ſtupefactive Power of the *Torpedo*, and the Tremulous Motion of the Briſtles of the *Porcupine.*

Laſt of all he conſiders the *Motions* of *Febrile Heat*, rejects the Common Definition that it is a Heat kindled in the Heart, and denies the *Carteſian Hypotheſis*, that a *Focus* or *Ferment* in the Heart is the Cauſe of Fevers; or, that the Fever proceeds from the Blood fermenting and irri-

rating the Heart; or from a Mixture of a Chyle of an incongruous Nature producing a Fermentation and Ebullition; and proves by Experiment that the Blood being alter'd by Heat, Putrifaction, or Mixture of Salts or Sulphurs, produces not a Fever; but he aſſerts that the *Spirits* or *Nervous Juices*, being rendred more *Acrimonious* than ordinary, irritating the *Nerves* and the *Heart*, are the firſt and immediate productive Cauſes of *Febrile Heat*, the manner whereof he explains; the *Alteration* of the *Nervous Juices* he aſcribes to the Obſtruction and ill Diſpoſition of the *Glandules*, and the Irritation of the Roots of the *Nerves*; the Cauſe of *Fermentation* being an unnatural Retaining of thoſe Particles, which ought to be ſeparated from the *Nerves*, or an *Infection* communicated there to them, fit to produce a Diſorder of the *Spirits*; he gives an Account of the Nature of *Febrile Paroxiſms* in ſeveral Kinds, and of the Cauſe of *Symptoms* accompanying thoſe *Paroxiſms*, and of the Diminution and Termination of thoſe *Paroxiſms* by Diſcharge of the irritating Matter, and why the *Paroxiſms* are renewed at certain times, according to the Quantity or Stubbornneſs of the Fermentive Matter, and greatneſs of Obſtructions; he inſtances in ſeveral ſorts of *Fevers*, lurking Fevers, Hectic Fevers, *&c.* he conſiders the Ways of *Curing* a *Fever*; how perform'd by *Nature*, by Opening Obſtructions and Diſcharging the *Febrile Ferment* by the *Excretory* Veſſels; he conſiders the Methods which *Phyſicians* Uſe in Curing *Fevers*; of whoſe *Art* he ſpeaks with Reſpect, yet he ſays, ſometimes Medicines do more Hurt than Good; he ſhews the Intention of the *Phyſician* in the Cure of Fevers, to be the Removing the Obſtructions of the Excretory Veſſels, and temperating the Fermenting Salts by Food and Drink, Light and Watry; by dulcifying and blunting the Saline Acrimony by mixing Salts of a contrary Nature; Concerning *Phlebotomy*, in Fevers he thinks it to do neither much Good, nor much Hurt, ſince Fevers are as Mortal in *France* and *Spain*, where 'tis much us'd in all Fevers, as in *Italy* and other Places where not at all; tho he con-

confeſſeth that ſometimes it may help by letting out the *Acrimonious* and *Malign Juices* inſtil'd into the *Veins* from the *Nerves* of the *Glandules*, and which Nature cannot diſcharge. So alſo *Emetics* and *Cathartics* ſometimes help, and ſometimes hurt, for that the *Humors* are not the *Cauſes* of Fevers, but only a *ſmall Ferment* in the *Nerves* communicated from the *Glandules*; tho thoſe Medicaments by *Vellicating* the *Glandules* may force them to a *Diſcharge* of their *Ferment*, or by their *Salts* contemperate the *Febrile Salts*; but ſince they bring away as well *good Humors* as *bad*; he concludes that they are *Dubious* Medicines.

The whole Work is adorn'd with great Variety of Cutts, in order to the more clear Demonſtration of Things.

Traité du Mouvement local, & du Reſſort. Dans lequel, leur Nature, & leurs Cauſes, ſont curieuſement recherchées, & oules Loix qu'ils obſervent dans l' acceleration & les pendules, & encore dans la percuſſion & la reflexion des Corps, ſont ſolidement eſtablies. Par le R. P. C. F. M. de Chales, *de la Compagnie de* Jeſus. *à* Lyon. 1682. *en douze.*

THis Excellent Perſon left the World about four Years ſince; at which time a Funeral Oration was ſpoken in his Honour at the Colledge of Jeſuits of *Turin* in *Piedmont*. He was deſcended of a Noble Family of *Savoy*, no leſs conſiderable for Dignities in the Church, than the Honours of the long Robe and the Sword; but he was more eminent by his own Perſonal Worth; his Lectures in the Colledge of *Clermont* procuring him the Admiration of all, from whence he was call'd to profeſs *Mathematics* in the Academy of *Turin*: His *Mundus Mathematicus*, his Art of *Navigation*, his *Geography* and *other Pieces*, are deſervedly in great Eſteem. This

Poſthumous Work is not unworthy his Name; wherein he explains the *Nature* of *Local Motion* and *Elaſticity*.

He examines the *Opinions* of the *Greateſt Philoſophers*, and without taking any *Party* gives us many *Curious Things* on theſe *Subjects*; and ſeems much to wonder that ſince the ſeveral *Sects* of *Philoſophy* now *in vogue* ſuppoſe *Local Motion* for the *Soul* and *Principle* of their *Hypotheſes*, that they have taken ſo *little Care* to enquire into its *Cauſes* and *Nature*; and given *Rules* ſo *little Conformable* to *Experience*.

The Treatiſe is divided into *five* Books. The *firſt* contains ſome *Phyſical Propoſitions* concerning the Nature of *Local Motion* and *Elaſticity*; in which at firſt he deſtroys the Foundation of the *Carteſian Hypotheſis*; *viz.* That Motion begun ought always to continue; That one Motion can produce another; That Motion is continued by a ſubtile Matter. He weighs the Reaſons for and againſt an *Impreſs'd Quality*. He affirms that the Motion of the *Medium* continues not the *Movement* of Bodies *projected*; that *Elaſticity* doth. He brings Reaſons to eſtabliſh a *Proper Rarefaction*; that is, that under the ſame Quantity of Matter, and with the ſame abſolute Weight, a Body takes up a greater Space, and that without the Mixture of any foreign Bodies. He explains the Nature of *Elaſticity*; endeavours to confute the *Carteſians* and *Epicureans*, ſeeming to defer more to the Doctrines of *Ariſtotle*.

The *ſecond* Book conſiders the *Proprieties* of *Elaſticity*; whereon he gives us many Curious *Theorems*, and often Reaſons againſt the *Hypotheſis* of *Des Cartes*.

The *third* Book treats of *Acceleration* of *Movement*, of which the Philoſophers have ſo much endeavoured to give Account, particularly as to *Heavy Bodies*. This Subject he explains both *Phyſically* and *Mathematically*.

And becauſe it is impoſſible to eſtabliſh any thing *Particular* concerning the *Powers* of *Elaſticity*, without firſt determining thoſe of *Shoc* or *Percuſſion*, which ordinarily cauſes *elaſtic Motion*; therefore he makes that the Subject

Subject of his *Fourth* Book; In order to give Rules of *Reflex Motion*, which is the moſt ſenſible Effect of *Elaſticity*, whereof he treats with Abundance of Ingenious Speculation in his *Fifth* Book.

Varia Opera Mathematica D. Petri de Fermat, *Senatoris Toloſani. Acceſſerunt ſelectæ quædam ejusdem Epiſtolæ, vel ad ipſum à pleriſque Doctiſſimis Viris Gallicè, Latinè, vel Italicè, de rebus ad Mathematicas Diſciplinas, aut Phyſicam pertinentibus ſcriptæ.* Toloſæ 1679. *In* Folio. *Sold by* Robert Littlebury, *at the* Kings Arms *in* Little Britain.

MOnſ. *de Fermat* (who died almoſt twenty Years ſince) was an Incomparable *Lawyer*, a good *Poet* in the *Latin*, *French* and *Spaniſh* Tongues; Excellent in the Art of *Critic* and Knowledg of *Antiquity*, as his Obſervations on *Athenæus*, *Syneſius*, *Theon Smyrnæus*, and *others* do teſtify; but his greateſt Talent lay in the *Mathematics*, and principally in the Knowledge of *Numbers* and *Geometry*; upon which Matters he entertain'd a Particular Correſpondence with M. *Des Cartes*, *Toricelli*, *Paſcal*, *Frenicle*, *Roberval*, *Huygens*, and the moſt Part of the greateſt *Geometers* of *England* and *Italy*; and had a ſtrict Friendſhip with M. *de Carcavi*, his Fellow-Counſellor in the Parliament of *Toloufe*.

This *Poſthumous* Collection of his Works is now publiſh'd by his Son M. *Samuel de Fermat*; wherein we are preſented with an Introduction *Ad locos planos & ſolidos*, with an *Appendix* containing the *Solution* of *Solid Problems*; written before M. *Des Cartes* publiſh'd any thing on that Subject. Two Books of *Apollonius Pergæus*, *De locis planis*, reſtor'd; beyond what hath been done by *Franciſcus Vieta* in his *Apollonius Gallus*, *Willebrordus Snellius* in his *Apollonius Batavus*, *Marinus Ghetaldus* in his *Apollonius Redivivus*. A Treatiſe of *Tranſmutation* and

and *Emendation* of *local Equations*, in order to the various comparing of *Curve lin'd Figures* among themſelves, or with *Right lin'd*; to which is annex'd the uſe of *Geometrical Proportion* in ſquaring Infinite *Parabola's* and *Hyperbole's*. A diſcourſe of the uſe in *Algebra* of *ſecond Roots*, and thoſe of a farther Order; with an *Appendix* thereto. A method *De Maximis & Minimis*, ſerving not only to the Determination of *Plain* and *Solid Problems*, but alſo to the Invention of the *Tangents* of *Curve lines*, as the *Parabola*, *Ellipſis*, *Cyſſoide*, *Concoide*, *Cycloide*, *Quadratrix*, &c. as alſo the *Centre of Gravity* in *Solids*, and to *Numerical Queſtions*. A Diſcourſe of *Sphærical Contacts*, outgoing what hath hitherto been done in that kind. A *Geometrical Diſſertation* of the *Compariſon* of *Curve lines* with *Right*; with an *Appendix* thereto. A *Threefold* diſcourſe of the *Solution* of *Geometrical Problems* by moſt *Simple Curve lines*, and moſt agreable to all ſorts of *Problems*; wherein he ſhews that there may be a more eaſie *Diviſion* of *Curve lines* into *Certain Ranks*, than that of *Des Cartes*, An Eſſay of renewing the Doctrine of *Priſmata*, whereof remains to us little from the *Ancients*. Hereunto is annex'd a *Collection* of *Letters* between M. *de Farmat*, *Merſennus*, *Paſcal*, *Roberval*, *Freniti*, *Carcavi*, Sr. *Kenelm Digby*, (to whom he ſent his *Remarks* on Dr. *Wallis* his *Arithmetica Infinitorum*, as alſo ſeveral *Problems* propounded for ſolution to the Doctor, and the Lord Vic. *Brouncker*) alſo *Gaſſendus*, the Abbot *Benedetto Caſtelli*, and others; concerning *Geometrical*, *Geoſtatical*, *Mechanical* and *Analytical Problems*. We ſhall ſay nothing of his obſervations on *Diophantus* publiſh'd in the Year 1670, and his *Doctrinæ Analyticæ Inventum novum* collected from his *Epiſtles*, and publiſh'd by *Jac. de Billy S. J.* nor of his *Objections* againſt the *Dioptricks* of M. *Des Cartes* which are to be ſeen at large in the *third Tome* of his Letters.

Obſerva-

Obſervations upon the Dublin *Bills of Mortality*, 1681. *And the ſtate of that City. By the Obſervator on the* London *Bills of Mortality*. London, 1683. *In* Octav. *Printed for* Mark Pardoe, *at the* Black Raven *over againſt* Bedford-Houſe *in the* Strand.

THIS ſufficient for the Praiſe of this ſmall Tract of Obſervations upon the *Dublin* Bills of Mortality, that it is written by the *Obſervator* on thoſe of *London*; a Perſon of Extraordinary Talents; and although the former were Founded upon Bills regularly kept for near an Hundred Years, and theſe on a much leſs Number; nevertheleſs we are here preſented with ſeveral Curious Remarks; which he hath grounded on three Tables, whereof we ſhall give ſome Particulars.

The *Firſt* contains ſix Years Bills of *London* and *Dublin*, of Births and Burials; hereon he Obſerves that the Burials of *London* exceed thoſe of *Paris*; that Births in *London* are to Burials in Proportion as 5 to 8, which holds likewiſe in *Dublin*; that the Burials in *Dublin* are about a twelfth of *London*; that Births are the beſt way of judging of the Increaſe and Decreaſe of *People*, Burials being ſubject to more variety of Cauſes and Contingencies; that the afore-mentioned Proportion may be ſet for the Standard of Health in the ſame Places; that there are more Males than Females, that when moſt Dye, feweſt are Born, *& vice versâ*.

The *Second* Table conſiſts of fifteen Years Bills of *Dublin*, diſtinguiſh'd in five *Ternaries*, whereon he grounds his Judgments as to the Standard of Health and Increaſe of People in that Place,

The *Third* contains an Account of the Families and Hearths in *Dublin* for one Year; and Births and Burials for three; hereon he Obſerves the Proportions of Births and Burials in ſeveral Pariſhes, and eſtimates the Number of People; he aſſerts nevertheleſs that without the knowledge of the true Number of People (which how

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it may be eaſily taken he ſhews) the whole ſcope of keeping Bills of Births and Burials is impair'd; and that Conjectures and Calculations may be ingenious but unſatisfactory.

His *Poſt-ſcript* furniſhes us with the form of three Bills, one Weekly, one Quarterly, and another Yearly for the City of *Dublin*; hereon he Obſerves the inequality of thoſe Pariſhes; and that the People there are more crouded than in *London*; and gives Reaſons why the preſent Forms of Bills ſhould be chang'd; he ſets down a Regular Form of Obſerving Caſualties, making the Number of the People the Fundamental Term in all Propoſitions; reckons the Obſervation of Marriages uſeful; and whether an Account of all Perſons of ſeveral and different Opinions in Religion is Neceſſary to be taken Notice of, he Humbly ſubmits to Authority.

The Chriſtian Tutor, *or a Free and Rational Diſcourſe of the Soveraign Good and Happineſs of Man, and the Infallible way of attaining it, eſpecially in the Practice of* Chriſtian Religion. *Written in a Letter of Advice to Mr.* James King *in the* Eaſt-Indies. *By* Henry Jenkes, *Fellow of* Gonvil *and* Caius *Colledge in the Univerſity of* Cambridge, *and of the* Royal Society. *And now Publiſhed for the Benefit of all others. In* Octavo. 1683. London, *Printed for* Henry Faithorne *and* John Kerſey, *at the* Roſe *in St.* Paul's *Church-yard.*

WHat this *Worthy Gentleman*, who deſervedly bears the Character both of a Good *Philoſopher* and a Good *Chriſtian*, deſign'd for the *Private Uſe* of a Friend, his *Communicative Goodneſs* is pleas'd now to make Public. His Deſign is to Guide us towards *Happineſs* by the Ways of *Vertue* and *Religion*; in Order whereto he gives many *Excellent Rules* and *Inſtructions*, and likewiſe informs us what *Learned Writers* we may recur to for farther *Advice* and *Aſſiſtance*. Matthiæ

Matthiæ Tilingii, *Med. Doctoris, ejuſdemque Facultatis in Academiâ Haſſo-Schaumburgicâ quæ eſt* Rinthelii ad Viſurgim, *Profeſſoris Primarii, Archiatri Haſſiaci, Sacri Romani Imperii Collegii Naturæ Curioſorum Adſeſſoris Zephyri dicti*, &c. Lilium Curioſum, *ſeu Accurata* Lilii Albi *Deſcriptio, in quâ ejus Natura & Eſſentia mirabilis, nobilitas & præſtantia ſingularis, qualitates & vires ineffabiles ferè Philologicè, Phyſicè, Theologicè, Chymicè, & Medicè, ſecundum Leges & Methodum S.R.I. Academiæ Naturæ Curioſorum explicantur, multaque arcana, cum ſpiritualia, tum Naturalia revelantur.* Francofurti *ad* Mænum. 1683. *In Octavo.*

THIS *Laborious Author* Prefaces to his Book with an *Enumeration* of a great many Curious Plants growing in the ſeveral Parts of the World, as the *Granadilla* of *Peru*, the *Roſa Cynica*, the *Frutex Mogori Indorum*, ſeveral ſorts of *Roſes*, *Violets*, *Amaranthi*, *Jaſmins*, *Tulips*, *Hyacinths*, *Narciſſus*, *Anemonies*, and others; before all which he prefers the *White Lilly*. This he conſiders *Philologically*, *Phyſically*, *Theologically*, *Chymically*, and *Medically*.

In his *Firſt* Part he gives the *Etymology* of the Name; the *Synonomie* or ſeveral Names to the ſame ſenſe; the *Homonomie* or ſeveral Significations of the ſame Name; the *Paronymie* or Derivatives from thence; the Original, Nature, and Deſcription; the Differences, which are many: He deſcribes the Place of its Growth, the Time, the Culture and Signature, the Colour, Scent, Taſt, *&c.* its Qualities and Vertues: He conſiders its *Worth* in general, which he Illuſtrates from many Places of *Scripture* and the *Fathers*, which make mention of it, drawing Compariſons and Inferences from thence.

The *Second* Part ſhews the manner of uſing it in form of Juice, Decoction, Water, and Spirit; in Form of Pills, Conſerves, Syrups, Oyls, and Oyntments.

The *Third* Part ſets forth the ſeveral Compoſitions of Medicines, wherein the *White Lilly* makes a conſiderable Part, as Deſcrib'd by ſeveral Authors, *viz. Decoctions* and *Waters*, principally *Coſmetics*, *Spirits*, *Tinctures*, *Mixtures*, *Liquors*, *Eſſences*, *Emulſions*, *Lixivia*, and *Syrups*; alſo *Powders* and *Salts*, *Clyſters*, *Oyls*, *Liniments*, *Oyntments* and *Balſams*, *Cataplaſms*, *Sear-cloths*, *Plaiſters* and *Sacculi*, *Baths*, *Inceſſions*, *Fomentations*, *Injections*, and *Stillicidia*.

The *Fourth* Part enumerates the ſeveral Diſeaſes of Humane Bodies, both Internal and External, wherein the *White Lilly* is us'd by Phyſicians and Chirurgeons, as in the Diſeaſes of the *Head* and *Brain*, *Apoplexy*, *Epilepſie*, *Lethargy*, *Phrenſie*, &c. In Diſeaſes of the *Eyes*, *Ears*, and other parts of the *Head*; in Diſtempers of the *Throat*, *Breaſt*, and *Lungs*, as *Angina*, *Pleuriſie*, *Conſumption*, &c. In all ſorts of *Fevers*; in Diſtempers of the *Stomach* and *Inteſtines*; the *Meſentery* and *Pancreas*, the *Gall-bladder* and *Spleen*; in the *Scurvy*; in Diſeaſes of the *Kidneys*, *Genital Parts*, and *Bladder*; in the *Gout*, *Tumours* and *Apoſtems*; in *Ulcers*; in *Cutaneous* and *Capillary Affections*; in *Wounds*, *Contuſions*, *Pains*, *Luxations*, Hardneſs of *Tendons* and *Ligaments*, *Contractions*, *Corruptions*, and *Witherings* of the Limbs.

Martini Liſter, *è S. R.* Lond. *de fontibus Medicatis* Angliæ, *Exercitatio Nova*, *& prior*. Eboraci. *Sumptibus Authoris*. 1682. In Octavo.

THIS Inquiſitive and Curious Naturaliſt hath given many late Inſtances, that he is ſtill able to improve the Knowledge of Mankind in any thing that he is pleas'd to apply himſelf to, Nature having endow'd him with

with an extraordinary Sagacity; this is manifeſt in the Tract here before us, wherein he Examines the Principles of the *Medicinal Fountains* of *England*, eſpecially thoſe that have fallen under his own Knowledge; the Uſes and Effects whereof he may reſerve for a Second Part, if further Obſervation, Leiſure, and Health ſhall enable him to accompliſh ſo deſir'd a Work.

Chap. I. Diſcourſes of the Mature *Salts*, commonly found in *England*, as *Vitriol*, *Alum*, Common *Salt*, and *Nitre*, to which the Author adds a fifth *Species*, leſs known, though the moſt Plentiful, called by him *Sal Calcarius*, or *Lime Salt*; of all whoſe *Cryſtalliz'd* Concretions he gives us the ſeveral Figures, and Deſcriptions, ſo that every one of them may be particularly diſtinguiſh'd, and by comparing together the ſeveral Salts of *Medicinal* Waters, their Similitudes, and Contrarieties may be eaſily gueſs'd at.

Chap. II. Examines the ſeveral *Veins*, or *Oars* of *Iron*, as thoſe of *Swedeland*, *Devonſhire*, *Yorkſhire*, (whoſe Chalky Mountains are Fruitful in them) eſpecially *Weſtmorland*, (the only Countrey of *Europe* that affords *Black Lead*,) as alſo thoſe of *Suſſex*, eſteem'd the beſt, the *King*'s Guns being Caſt out of them; afterwards he proceeds to Diſcourſe of the *Pyrites*, *Copperas-ſtones*, or *Marchaſites*, found in ſeveral Places of *England*, whoſe Figures, Colours, and Mixtures ſeem to be very various, yet he concludes them all to be *Veins* of *Iron*, as the *Loadſtone* demonſtrates.

Chap. III. Enquires into the *Lime-ſtone*, which in Proportion is much more copious in *England*, than the *Metal* of *Iron*; the greateſt part of Mountains and hard *Glebes* being compounded of it; beſides, *Chalk*, white *Potters Earth*, *Flints*, *Gypſum*, the *Selenites*, *Stalactites*, are all reduc'd to this *Genus*, or *Tribe*.

Chap. IV. Gives a ſhort enarration of ſome *Medicinal*, and other *Mineral* Waters of *England*, eſpecially of thoſe known to himſelf; all the *Cryſtals* of *Salts* are refer'd to *Sal Commune*, and *Nitrum Calcarium*; as alſo *Glebes* to

Ochre, and *Lime-ſtone*; from theſe Principles he examines the Fountains at *Knazeborough*, *Scarborough*, *Maulton*, *Clifton*, &c. *Petrifying*, *ſtinking*, *ſweet*, *ferrugineous*, or *Atramentous*.

Chap. V. Enquires into the Origine of the aforementioned Principles, contained in the *Mineral* Waters of *England*; the Nativity of *Marine*, or Common *Salt*, is the moſt ſimple, being a meer *Liquation* of a pure *Metallick* Body, therefore 'tis found in Water without any Terreſtrial Sediment; but where the *Nitrum Calcarium* is, there alſo the *Lime-ſtone* it ſelf is met withal; ſo that this *Salt* ſeems to germinate from it, as *Vitriol* does from the *Pyrites*, they being both Effloreſcencies of their reſpective Stones, carried on after the manner of Vegetation in Plants, there being not one grain of theſe *Salts* to be obtain'd from their Mineral Concrets, before the germinative Fermentation of Nature comes on; *Ochre* is the Abortive *Fætus* of *Vitriol*, whilſt the *Marchaſite* lyes under Water, debarr'd of the cooperation of the Air; ſo *Chalk* alſo is thought to be the product of a *Calcarious Salt*, as *Ochre* is that of *Vitriol*.

Chap. VI. Confutes the *Helmontian* Opinion of the Generation of *Vitriol*, which derives its Origine from a Corroſion of the *Marchaſite* by a hungry *Univerſal Salt*, Natural to Water; firſt becauſe the exiſtence of ſuch a *Salt*, as hath no manifeſt Quality, cannot be prov'd to be in Nature; Secondly, *Copperas-ſtones* cannot perfect their *Vitriol* under Water; Thirdly, they are not corroſible by *Aqua Fortis*, *Spirit* of *Nitre*, or any other Powerful *Menſtruum* whatſoever, though *Iron* ſeparated from them, is: Therefore *Vitriol* is generated rather from a continual ſlow *Germination* of the *Marchaſite*, than from any ſenſible Corroſion; that *Ochre* contains *Vitriolick* Principles, is Evident from hence, that after it hath been ſo long waſh'd, that *Galls* will no longer change with it, yet being ſet in a moiſt place, will yield again a *Vitriolick Efflureſcence*, as well as the *Pyrites* it ſelf; *Atramentous* Waters do ſoon ſeparate, and depoſite their *Ochre*, and

will

will never Unite with it again, contrary to what happens in Bodies diſſolved by Chymical *Menſtruums*; Laſtly, he touches upon the Opinions of the *Pariſian Philoſophers*.

Chap. VII. Makes it probable, that perfect Mature *Vitriol* is ſeldom or never found in our *Medicinal* Fountains, but that the whole Subſtance of the *Pyrites*, or *Marchaſite* is colliquated in the *Atramentous* Waters into an *Ochre*, or *Abortive Vitriol*, which otherwiſe in the external Air would have totally germinated into genuine *Vitriol*; no Wonder therefore that the *French Virtuoſo's* could not meet with that *Mineral* in Perfection after a ſearch into an hundred *Medicinal Fountains* of *France*; and *Helmont* is not to be Credited, whilſt he affirms that he Extracted *Vitriol* out of the *German* Spaws, called *Pouhont*, and *Sauvener*, in the Countrey of *Leige*; the Waters growing black with *Galls*, their *Præcipitations* with *Lixiviums*, and other *Phænomena* are attributed to the *Ochre*, which is the entire Body of the *Pyrites* under the form of a *Juice*; yet 'tis not to be deny'd, but that *Vitriol* conſiſting of *Saline*, *Sulphureous*, and *Ochreous Principles*, may ſometimes upon particular contingencies be found in Water in one of thoſe three ſtates of Maturity.

Chap. VIII. Explains the Ingredients of *Petrifying Fountains*, and the Reaſons of *Petrification*, which is aſcrib'd to the *Marchaſite*, and *Lime-ſtone*, diſſolv'd by a ſubtile *Aura* in thoſe Waters, and inſinuating themſelves into the Pores of Wood, Leaves, and other Bodies; thoſe *Petrified* Bodies will yield a *Vitriol* in the Air, a good Argument of their being loaded with the *Pyrites*, or *Marchaſite*; the *Ochre* and *Lime-ſtone* of theſe Waters falls ſeparately to the bottom without any Concretion, and the Fountains ſeldom appear troubled.

Chap. IX. Treats of the *Incaleſcence* of *Baths*, which is imputed to the growing, or *Vegetating Salts* of the *Marchaſite* and *Lime-ſtone*; becauſe the *Pyrites*, or *Marchaſite* is *Sulphureous*, Inflammable, and both thoſe *Minerals* in their *Saline Germinations* ſend forth a hot ſteam, or *Halitus*, which is manifeſt in the opening of Wells, Vaults, and

and Mines, ſo that the Diggers are often endanger'd by them; beſides, no *Engliſh* *Mineral*, or *Metal* abounds with *Sulphur*, but what is a *Pyrites*, or elſe participates ſomething of the Nature of a *Marchaſite*, to know which, the *Loadſtone* is the beſt Guide; not only the heat of *Baths*, but alſo *Thunder*, *Lightning*, and *Earthquakes* are all aſcrib'd to the *fiery breath* of this *Pyrites*, variouſly diſpos'd; the warmth of *Lime-ſtone* while in the ſtate of *Vegetation*, or *Saline Efflorescence*, is very manifeſt in Pits and Wells, eſpecially thoſe at *Rome*, whoſe ſteams in the coldeſt Froſty Weather are thick and warm like thoſe of *Baths*; beſides this Evidence of Senſe, the heat of ſome Fountains is indicated from the *Perennial* greenneſs of *Plants* in and about the Water, and from their averſion to Freeze; nothing, that our Inquiſitive Author knows of, ſends forth ſuch a *tepid Vapour*, beſides the *Pyrites* and *Lime-ſtone*; therefore the *Incaleſcence* of *Baths* may be attributed to both theſe together, or ſometimes ſeparately; to corroborate this Opinion of the *Incaleſcence* of *Baths* from the afore-mentioned *hot Vapours*, he adds the Arguments of the *Royal Pariſian Academy*, Publiſh'd by M. *Du Clos*, together with many of his own; afterwards he refutes ſeveral *Hypotheſes*, as that the heat of theſe Waters proceeds from an *accenſion* of *Mineral Principles by Subterranean Fires*, or the *Air*, from *Corroſions* between *Salts* and *Metals*, or from the *Luctations* of contrary *Salts*: The *Somerſet-ſhire Baths*, beſides their *Nitre* and common *Salt* (which laſt is double the Quantity of the firſt) yield an *Ochre*, and *Lime-ſtone*, and are more *Atramentous* in Froſty, than Open Weather.

Chap. X. Examines the Riſe and Matter of Rain, from the Exhalations of Water, Animals, and Plants, but more eſpecially from Subterraneous Metalline Salts, particularly thoſe of *Germinating* *Marchaſites*, and *Lime-ſtones* Subliming great variety of Particles along with them.

Chap. XI. Treats of ſtinking Fountains, which are very common in the Northern Mountainous places of *England*, whoſe Odour proceeds from a Sulphureous Vapour or *Halitus*

Halitus of the *Pyrites*, the greateſt part whereof is *Præcipitated* in its very Nativity, ſo that the *Fætor* is the effect of that dejection; theſe Waters are ſaid to be impregnated with common *Salt* only; the Symptoms of the aforeſaid *Præcipitation* or dejection, are firſt a white Cream, or *Flos*, floating on the Superficies, and adhering to the circumjacent parts, which is a meer Sulphur that tinges Silver firſt Yellow, then Black; Secondly, a black Clay; Thirdly, Stones, Straws, Stalks, &c. of a Purple Colour. Fourthly, a more than ordinary Perturbation of the Water. Fifthly, a diminution of the fætid, and tinging Faculties upon Decoction; one Cauſe of this *Præcipitation*, and *Fætor*, may partly be the Rottenneſs or Obſtruction of the *Aquæduct*, the Water firſt ſtagnating there Accidentally; and in truth, all theſe Fætid Waters are thought either to ſtagnate, or elſe to be very ſluggiſh. Every Mineral, or at leaſt *Atramentous* Water, will ſend forth the ſame Sulphureous ſtinking ſmell, if kept ſtagnating for ſome time in Veſſels.

Chap. XII. Is an Examination of all the Ingredients that our own Writers have plac'd in the *Medicinal* Waters of *England*, as *Nitre*, *Sal Marine*, & *Alum*, which laſt will not turn black with *Galls* unleſs it participates of the *Marchaſite*, which is often found mixt with *Aluminous Veins*, as may be ſeen by burning the *Alum-ſtone*, a *Sulphur* appearing at the top of the heap, or elſe may be diſcover'd more clearly by the *Load-ſtone*; though indeed the Author keeps by him an *Aluminous Glebe* brought from *Ireland*, that germinates and works out an *Alum*, as the *Pyrites* does *Vitriol*, theſe *Aluminous Efflorescencies* will not turn black with *Galls*; ſuch *Aluminous Veins*, void of *Marchaſites*, are ſeldom or never found in *England*. Therefore it may be concluded, that the *Ochre* found in ſeveral *Spaws* is not of an *Aluminous* Off-ſpring, but rather ſprings from the *Marchaſite*, as the *Load-ſtone*, and the germination of that *Ochre* it ſelf into a green *Vitriol*, does frequently evince, notwithſtanding P. *Guiry* (a late *French* Author Living at *Provins*) is ſo fond of his *Aluminous Salt*. Thus far the Ingenious

Ingenious M. *Liſter* hath proceeded in the *Hiſtory* of our *Engliſh Spaws*, whoſe piercing Induſtry is the more commendable in this, that it employs its ſelf frequently in the Diſcovery of ſuch things as relate to the Natural improvement of his own Countrey.

Hiſtoria Moſchi ad Normam Academiæ Naturæ Curioſorum, Conſcripta à Luca Schrockio, *M. D.* 1682. 4to.

THere are ſo many Natural Curioſities relating to *Musk*, that this Learned Author has thought it worth his Pains to furniſh the World with a Hiſtory of it; firſt laying down all the *Etymologies*, and the many *Names* which are beſtow'd upon *Musk* in ſeveral Parts of the World; then going on to the Places of its Generation and Birth, about which both *Travellers*, and *Medical Writers* diſagree very much; ſome affirming it to be a Purulent Excrementitious Humour, Extravaſated, Concocted, and gather'd into a Bag or Purſe (after the manner of an Impoſtume in its *Cyſtis*) near the *Navel* of the *Musk-Animal*, which Creature growing wanton with *Venery*, rubs its Belly againſt Stones and Trees, tearing, and letting out thereby the *Musky* Matter out of its Bladder, or Receptacle, which by the Air and Sun is Coagulated, and digeſted into a *Concrete*, or Subſtance indued with the Texture, Odour, and other Qualities of *Musk*, the Wound conſolidating of its own accord, that Nature may work again in the ſame Shop the like Odoriferous Ware within the ſpace of one Year. The Inhabitants of the *Eaſtern Countries* being well acquainted with the Tracks and Cuſtoms of theſe Animals, go up and down to gather this Precious ſweet-ſcented Matter, ſticking to the Rocks, Trees, and Earth, which they often Preſent to their Kings, Great Men, and Governours. Some will not allow this *Menſtruous Impoſtumated Subſtance* to be let out of its Cell by any Laceration, caus'd by Rubbing, but by its

its own Excretory Paſſage, aſſign'd by Nature for that End, there being never any Scars obſerv'd upon that Part, beſides there being a manifeſt Channel for its conveyance out. Others contradict all this, affirming that the Inhabitants Hunt the *Musk-Deer*, or *Goat*, at a certain time of the Year, killing them with Arrows; or elſe in the Months of *February* and *March*, after theſe Creatures have endur'd a ſharp Hunger by reaſon of the great Snows that fall where they Breed, ten or twelve Foot deep, they will come to 44 or 45 Degrees to fill themſelves with Corn and New Rice, and then it is that the Natives lay Gins and Snares to catch them, or elſe ſhoot, or run them down, they being very lean, and faint with Famine at that Seaſon; afterwards they cut off the Bag, ſtuff'd with a Concrete of a Fætid Odour, which being elaborated, and prepar'd in the Air and Sun, gets a grateful *Musky* ſmell: This Opinion is confirm'd by the Obſervations of Merchants, who do moſt commonly buy the *Musk* folded up in its own Natural Bag. Some of the *Aſiatics* out of Avarice, and a ſordid Proſpect of Gain, have invented many Tricks and Ways to obtain great Quantities of *Musk*, as by whipping, and beating the poor Animal to that degree, till the Blood ſettles outwardly into Tumours, and Nodes, under which they make ſtrong Ligatures, and ſo cut them off, drying and working this Blood into a *Musk-like Subſtance*; for they are ſo much Philoſophers, as to obſerve the *Natural Musk* to be only *Impoſtumated Blood*. Some are of Opinion, that the Reins, Teſticles, Bones, Fleſh, Bowels, Excrements, and all the Parts of this Animal do afford good *Musk*; but our Judicious Author concludes that only to be the true genuine *Musk*, which the Animal by inſtinct caſts out of its Bag at a certain time of the Year, or elſe that which is got in the Bag, when the Animal is kill'd exactly at the time when the *Musk* is in its Maturity and Perfection; becauſe it has undergone all the Concoctions, and the whole Courſe of Nature; the other ſorts, or kinds being either Imperfect, as being got before the due Time, or Harveſt; or elſe

Counterfeit, and Adulterate, being made by Artificial and Unnatural Means.

There is such variety of Descriptions of the *Musk-Animal*, that a Man can scarce frame any Idea of it; it being compar'd both to a Goat, Deer, Cat, Fox, &c. The Creature dissected at *Paris* by M. *Peyer*, at the *French* King's Command, as also that brought into *Swedeland*, were both Counterfeit. The Figures given by *Gesner*, *Aldrovandus*, and *Johnston* scarce deserve to be mentioned; those extant in P. *Michael Boymus*, *Kircher*, *Calceolarius*, and *Camerarius* are all Faulty; that in *Joh. Neuhofius* is more Accurate; yet still those of *Tavernier*, and *Segerus* are esteemed more exact than it; but this of *Schrokius* seems to be the most Correct of all. Of which we here give the Figure.

Vide Fig. 1.

This *Musk-Animal* breeds in large Forests, and Feeds commonly upon *Aromatic Herbs*; there must surely be a *Prodigious Number* of them, none of them having above *one Bag*, and that no bigger than a *Hens Egg*, yielding not above half an Ounce of *Musk*, sometimes three or four will not afford one Ounce; and yet what a vast Quantity of *Musk* is bought up Yearly? M. *Tavernier* himself in one Voyage to *Patna*, bought 7673 Bladders that weigh'd 2557 Ounces and an half, and 452 Ounces out of the Bladder. This Creature is found only in some Eastern Countries, as in several Provinces of *China*, *Tartary*, *Pegu*, *Siam*, *Bengala*, *Boutan*, and some other Places subject either to the Great *Mogul*, or Great *Cham*, being never seen in *Africa*, or *America*, or any *Island*; though indeed the *Civet-Cat* (which is often falsly taken for the *Musk-Animal*) breeds in *Ceylon*, *Sumatra*, *Java*, and some Parts of *Africa*.

The *Musk-Bag* is but one in each *Animal*, situated in, or near the *Umbilical Region*, being of the same Magnitude and Figure with a small Hens Egg, containing two, sometimes four *Drams* of *Musk*. It is covered with a Skin, divisible into four *fine Coats*, or *Membranes*, and with Hairs, Rooted in several little subjacent Glandules.

About

About the Middle, or Centre of this Bag there is a *Carneous Protuberance*, in which runs the Excretory Channel for the Paſſage of the *Musk*, a Muſcular Subſtance encompaſſing the ſides of it, in order to the retention, or expulſion of the *Musk*. There are alſo ſeveral Blood Veſſels belonging to this Part. *Vide* Fig. 2, & 3.

As moſt Commodities are often-times Adulterated, ſo none more than *Musk*, eſpecially by thoſe Ingenious, and Crafty Merchants, the *Chineſes*, who do frequently Sophiſticate it with the dry'd prepar'd Excrements, Blood, and other Parts of ſome Animals (eſpecially with thoſe of the *Musk* Creature it ſelf) with *Aromatic* Gums, Seeds, and Woods, ſprinkled with Volatile Spirits, and ſtuff'd into *Natural Musk-Bags*, or *Artificial Bladders*, made of the Skin of the Belly of the Beaſt, reſembling the true ones. Therefore the beſt way to diſcover the Cheat is to open the Bags, and if the *Musk* is regularly rowl'd up in its Natural Fold, and cloath'd with a fine ſlender Skin, winding it ſelf about it, then there is a great probability of its being Genuine: The Natural Situation of it being the beſt Rule whereby to know it. As for the Colour, Odour, Taſte, and Weight, they are ſo very deceitful, and vary upon ſo many little Circumſtances, that the Merchant cannot take any certain Meaſures from them. The Famous Traveller, M. *Tavernier* Obſerves, *That as ſoon as the Natives have cut off the Bladder, and taken out as much* Musk, *as that the Deceit may not be too palpable; they frequently fill up the Veſſel with little ſtones, or pieces of Lead to make it Weight; and the Merchants are leſs diſpleas'd at this Cheat, than that of Adulterating it by ſtuffing the Bag with the Liver and Blood of the Animal ſlic'd together; for this Mixture in two or three Years time produces certain Animals in the Bladder, that eat and waſte the good* Musk: *The King of* Boutan *fearing that the various Adulterations of* Musk *would ſoon ſpoil the* Musk-Trade, *Ordered that none of the Bladders ſhould be ſow'd up, but that they ſhould be all brought to* Boutan, *and*

there, after due Inſpection, be Sealed up with his Seal; yet notwithſtanding all the warineſs, and care of the King, they will ſometimes cunningly open, and Sophiſticate them. The Smell is accounted the Life & Soul of the *Musk*, therefore it is to be carefully preſerv'd in Gold, Silver, Jet, Amber, Porcellane, or Glaſs Veſſels very well ſtop'd; Leaden ones are commended by ſome, but diſprais'd by others. True it is, that ſhould they tye up the Bag ſo ſoon as they cut it off, without giving it Air, or time to loſe its force, the ſtrength of the Perfume would cauſe the Blood to guſh out of the Noſe. The ſcent of the Beaſt which M. *Tavernier* carried to *Paris*, was ſo ſtrong, that he could not keep it in his Chamber, for it made all Peoples Heads ake that came near it.

There is nothing in Nature ſo Wholeſom and Uſeful, but in ſome reſpects it may prove Hurtful; ſo *Musk* has often been obſerv'd to Intoxicate, to bring on Pains in the Head, Tremblings, Dizzineſs, Faintings, *Hyſteric* Fits, *Hæmorrhagies*, *Nocturnal Pollutions*, Conſumptions, Paleneſs, and to be noxious in *Epilepſies*, *Phrenſies*, and other *Cephalic* Caſes, it being a hot Sulphureous Body, and ſo conſequently may raiſe Tumults in the Blood, and Spirits, therefore it ought to be given with great Caution and Judgment.

All Writers agree, that *Musk* is *Cordial* and *Alexipharmic*, Correcting *Opiate* and *Viperine* Poyſons, yet *Diemerbroeck* found it very Prejudicial in the *Plague-time*: In ſeveral moiſt *Cephalic* Diſtempers it often proves Beneficial, (eſpecially when Methodically us'd) as *Hydrocephalo's*, Stupidity, Melancholy, Cold Humours, Palſies, and *Apoplexies*, in *Lethargies*, and many other Diſeaſes in the Head, where there is thought to be no Inflammation, or Fury of the Spirits; it prevails often in Defluxions of the Eyes, in Deafneſs, Filthineſs, and other Obſtructions as well of the Ears, as Noſtrils, in a ſtinking Breath, and loathſom Smells of ſeveral Parts, in Pains of the Teeth, and many Pectoral Diſeaſes; as *Aſthma's*, *Coughs*, *Phthiſicks*, (in which the *Chineſes* uſe it) in Palpitations

of

of the Heart, and Swoonings; in *Hydropical*, and *Hypochondriacal Dyſcraſies* of the Bowels; in Colicks, Worms, and ſome Uterine Diſtempers; in provoking Venery, in preventing Barrenneſs, and in Gouty Caſes; for *Muſk* is ſaid to *attenuate*, *diſſolve*, and *diſcuſs*. The Doſe is from *gr.* ij. *ad* x.

Muſk is much uſed in the Preparations of Odoriferous Spirits, and Liquors, it being either mix'd with the other Ingredients in the Cucurbite, or elſe plac'd in the Snout of the *Alembic*, or in the Receiver: Several Drinks are Perfum'd with *Muſk*, and many Oyls are made *Aromatic* thereby; Tinctures, Eſſences, Balſams, Sweet Soaps, and moſt Diſpenſatory Medicines have ſome of it in their Compoſitions; (great Variety of all which are to be found in this moſt Laborious Author.) Neither is it confin'd alone to Shops, Elaboratories, Ladies Cloſets, and Emperours Courts, but is admitted into the Temple, and Altar; ſo Powerful are its Charms, that its Odour hath been eſteem'd acceptable to Heaven it ſelf. The *Eaſtern People* are ſaid to be ſo Luxurious, and Effeminate, as to mix *Muſk* with all their Sauces, and Drinks, at their Publick Feaſts; neither are ſome of our *Europæans* far behind them in ſuch Extravagancies, their Cloaths, Gloves, Hair, Bracelets, Beds, Linnen, and Rooms being Perfum'd therewith, but the *Chineſes* are ſo wiſe, as to make better Uſe of this Commodity, in heaping up Annually incredible Treaſures by it.

Laſtly, The Author Concludes his Book with a Chapter of all thoſe Natural Things which ſmell like *Muſk*, and reſemble it in all its Odoriferous Qualities. In the firſt Rank he places the *Vegetables*, as *Muſked Cranes-Bill*, or *Muſcovy*. The *White Flowers* of a ſort of *Knap-weed*. The *Leaves* of a Plant called *Moſchatella*. Some *Hyacinths*, the ſweet *Muſk-Orchis*; the Yellow Flower of *Carduus Benedictus*; ſome *Moſſes* growing upon Rocks. Several *fine ſcented Herbs* found upon the *Apennine* and *Pyrenæan* Mountains; ſome *Roſes*, *Violets*, *Lillies*, *Majorans*, *Jeſſima-Flowers*, *Amber-greece*, &c. Both the *Eaſt* and *Weſt Indies*

Indies afford great Plenty of many other *Vegetables*, which ſend forth a *Musk-like* ſcent, neither have *Herbs* alone this Odoriferous Property, but ſeveral Animals alſo, as well Men, as Brutes, have in ſome part or other a whole *Magazine* of theſe *Aromatic Effluviums*, as *Plutarch* reports of *Alexander* the Great, and *Iſis*: *Heſiod* of *Tzetzis*, and at this day *Wedelius* knows a Student, from whoſe Body flows whole ſtreams of *Musk-like* Particles: Natural Writers mention ſeveral Creatures, as ſome Elephants, Crocodiles, Monkeys, Hares, Cats, Mice, Birds, Fiſhes, Serpents, and ſeveral Inſects, from whoſe Sweat, Excrements, or ſome other Parts, a *Musky ſcent* does often ſally forth; neither can Nature alone glory her ſelf in theſe Rich and Grateful Odours, but is often-times imitated by *Art*; ſo the *Chymiſts* in their *Secret Operations* upon *Sulphur*, *Vitriol*, *Amber*, *Urine*, and *Volatile Salts*, do frequently meet with ſuch *Scents*, as reſembles that of *Musk*.

The Fleſh of the Older *Crocodile* ſmells ſo ſtrong of *Musk*, that it naufcates; their Stones, at leaſt ſo called, are commended for a Rich laſting Perfume. The Cods of *Muſquaſſus* (a little Creature Feeding on the baſtard *Calamus Aromaticus*, and other ſweet Herbs) ſcent as ſweet & as ſtrong as *Musk*, laſting a long time, if handſomly incloſ'd in Cotton-Wool. *Hiſtory of* Carolina, *by* T. A. *p.* 22, 33. *And* Oldenburgh's *Philoſoph. Tranſact.* N. 85, 127.

Our juſtly Famous Countreyman, Mr. *Boyle*, mentions an *Odoriferous Musk-ſeed*, brought from the *Weſt-Indies*, and Preſented to himſelf, as alſo the *Musk Rats* of *Muſcovy*, and the *Musk Ducks*: He likewiſe ſpeaks of a *Dung-hill* in *Lincolns-Inn-Fields*, that ſent forth a very ſtrong ſmell of *Musk*; and of a *Monkey*, that upon eating of *Spiders*, did ſometimes fill the Room with a *Musky ſcent*: He alſo knew a *Gentleman* of a very happy Temperature of Body, whoſe Sweat upon a *Critical Examination* was found to be *Fragrant*. Upon mixing Sp. of *Vitriol*, or Sp. of *Vinegar* with ſmall *Pearls* unbroken, a Pleaſant *Musky ſmell* was produc'd. *See that Excellent Philoſophers Obſervations upon Odours.*

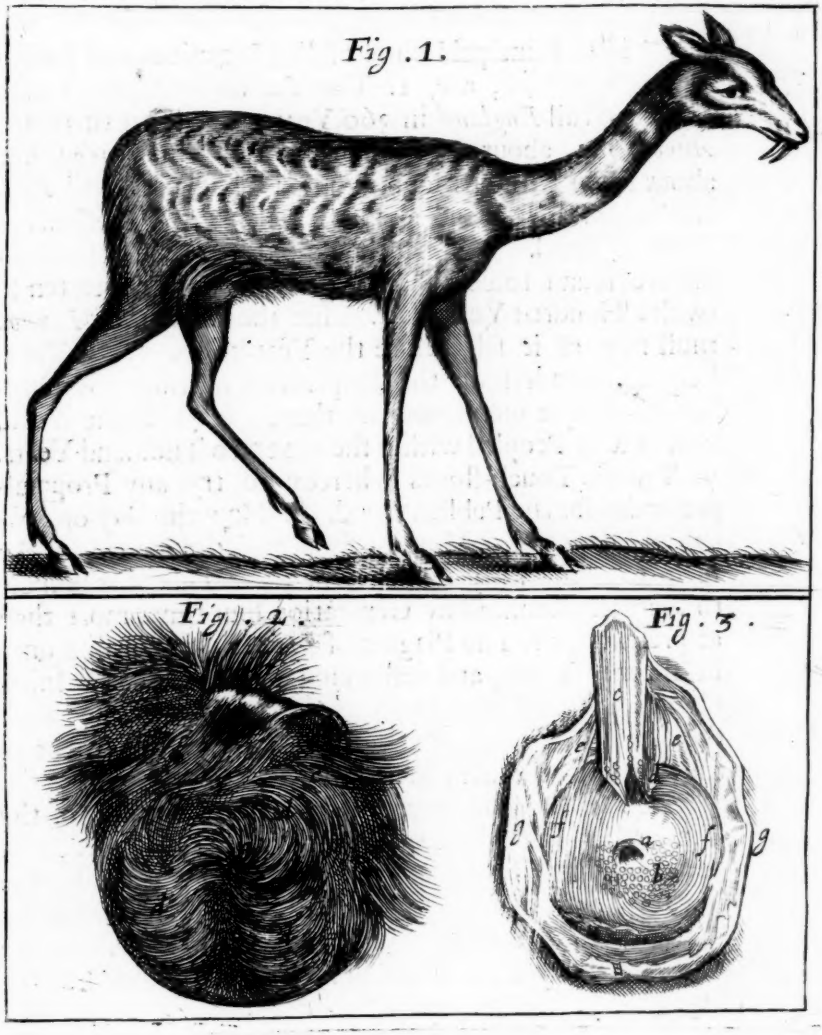
Explication

Explication of the Figures.

Fig. 1. *The Musk Animal.*

Fig. 2. *The Musk-Bag.* (a) *ſhews the Orifice of the Musk-channel.* (d) *The fine Hairs.* (e) *The thick groſſer Hairs.*

Fig. 3. *Repreſents the Internal Texture of the Bag, the inward Membranes being taken away.* (a) *The Musk-Channel opened.* (b) *The Glandules.* (c) *The Musk-pipe diſſected in two.* (d) *Its Orifice with the Glandules interſpers'd.* (e) *The Blood-Veſſels.* (f) *The Circular Muſcle.* (g) *The Cutaneous Subſtance.*



Another Eſſay in Political Arithmetick, concerning the Growth of the City of London; *with the Meaſures, Periods, Cauſes, and Conſequences thereof.* 1682. *By Sir* William Petty, *Fellow of the Royal Society.* London, *Printed for* Mark Pardoe, *at the* Black Raven *over againſt* Bedford-Houſe *in the* Strand. 1683. *In* Octavo.

THE Principal Points of this Ingenious and Judicious Eſſay, are, 1. That *London* doubles in fourty Years, and all *England* in 360 Years. 2. That there are, *Anno* 1682. about 670 Thouſand Souls in *London*, and about ſeven Millions four hundred Thouſand in all *England* and *Wales*, and about Twenty Eight Millions of Acres of Land. 3. That the Periods of doubling the People are found to be in all Degrees from between ten to twelve Hundred Years. 4. That the Growth of *London* muſt ſtop of it ſelf before the Year 1800. 5. A Table helping to underſtand the Scriptures concerning the Number of People mentioned in them. 6. That the World will be fully Peopled within the next two Thouſand Years. 7. Twelve Touch-ſtones whereby to try any Propoſals pretended for the Publick Good. 8. How the City of *London* may be made (Morally ſpeaking) Invincible. 9. An Help to Uniformity in Religion. 10. That it is poſſible to Increaſe Mankind by Generation four times more than at preſent. 11. The Plagues of *London* (happening once in Twenty Years, and deſtroying one fifth of the Inhabitants) is the Chief Impediment and Objection againſt the Growth of the City. 12. That an Exact Account of the People is Neceſſary in this Matter.

The *Poſt-ſcript* enlarges upon the Conſiderations of the Time when the whole World will be fully Peopled, and upon the Juſtification of the Scriptures concerning the Number of People mentioned in them, and concerning the Number of the Quick and Dead that may ariſe at the Laſt Day. Upon all which Particulars he Diſcourſes very Ingeniouſly.

FINIS.

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IN *Numb.* 41. p. 269. lin ult. *for* Comitiva Palatini, *read* Comitiva Palatina. *Numb.* 45. p. 313. l. 1. *r. to accommodate*; ibid. l. 32. *r. father'd upon Numb.* 47. p. 331. *l.* 21. *for* Pinguedinous Teneſmus, *r.* Pinguedinous, Teneſmous. *Numb.* 50 p. 372. l. 21. *for* Priſmata, *r.* Poriſmata.

What other Miſtakes occur, the Reader is deſired to Correct.

FINIS.